

CLAIMS

1. A backlight provided for a liquid crystal display device for illuminating thereof, characterized by comprising:
 - 5 a light source for emitting light; and
 - a diffuser disposed between the light source and the liquid crystal display device,

wherein said diffuser includes a diffusion layer for diffusing the light emitted from the light source, and a light distribution layer

10 integrally formed with the diffusion layer and disposed more toward the liquid crystal display device than the diffusion layer, for distributing the light diffused by the diffusion layer toward the liquid crystal display device.
- 15 2. The backlight as described in claim 1, characterized in that:

said light distribution layer has a prismatic surface on a surface thereof facing toward the liquid crystal display device.
3. The backlight as described in claim 1, characterized in that:
 - 20 said diffusion layer includes a diffusion element, and
 - a first resin forming the portion of the diffusion layer excluding said diffusion element, and the light distribution layer, is different from a second resin forming said diffusion element.
- 25 4. The backlight as described in claim 3, characterized in that:

said first resin has refractive index ranging from 1.2 to 1.7.
5. The backlight as described in claim 3, characterized in that:

said second resin has refractive index ranging from 1.2 to 1.7.
- 30 6. The backlight as described in claim 1, characterized in that:

said diffuser further comprises a light focusing layer for focusing the light emitted from the light source, formed integrally with the diffusion layer, and disposed more toward the light source than the diffusion layer.

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7. The backlight as described in claim 6, characterized in that:
said focusing layer has a prismatic shape on a surface thereof facing to said light source.

10 8. The backlight as described in claim 7, characterized in that:

said prismatic shape is composed of a plurality of different prism defined by the distance from said light source.

9. The backlight as described in claim 6, characterized in that:

15 said diffusion layer includes a diffusion element, and
a first resin forming the portion of the diffusion layer excluding said diffusion element, said light distribution layer, and said light focusing layer, is different from a second resin forming said diffusion element.

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10. The backlight as described in claim 9, characterized in that:
said first resin has refractive index ranging from 1.2 to 1.7.

11. The backlight as described in claim 9, characterized in that:
25 said second resin has refractive index ranging from 1.2 to 1.7.

12. A method for manufacturing a diffuser of a backlight provided for a liquid crystal display device for illuminating thereof, said method characterized by comprising:

30 a first charging step of charging a first resin into a first cylinder;
a second charging step of charging the first resin into which a

- second resin different from the first resin is mixed, into a second cylinder;
- 15 a first molding step of molding a two-layered sheet including the first resin and the first resin into which the second resin is mixed, by multi-layer extrusion molding, using the first cylinder into which the first resin is charged by the first charging step and the second cylinder into which the first resin into which the second resin is mixed is charged by the second charging step; and
- 10 a second molding step of molding a surface of the first resin of the sheet molded by the first molding step, into a prismatic shape by surface rolling.
13. A method for manufacturing a diffuser of a backlight provided for a liquid crystal display device for illuminating thereof, said method characterized by comprising:
- 15 a first charging step of charging a first resin into a first cylinder;
- 16 a second charging step of charging the first resin into which a second resin different from the first resin is mixed, into a second cylinder;
- 17 a third charging step of charging the first resin into a third cylinder;
- 20 a first molding step of molding a three-layered sheet by multi-layer extrusion molding, using the first cylinder into which the first resin is charged by the first charging step, the second cylinder into which the first resin into which the second resin is mixed is charged by the second charging step, and the third cylinder into which the first resin is charged by the third charging step, wherein the three-layered sheet is formed from the first resin, the first resin into which the second resin is mixed, and the first resin, with both exposed layers thereof being formed from the first resin;
- 25 a second molding step of molding a surface of one of the first resin-formed layers of the sheet molded by the first molding step into a prismatic shape by surface rolling; and
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a third molding step of molding a surface of other one of the first resin-formed layers of the sheet molded by the first molding step into a prismatic shape by surface rolling.

5 14. A method for manufacturing a diffuser of a backlight provided for a liquid crystal display device for illuminating thereof, said method characterized by comprising:

a mixing step of mixing a second resin into a first resin;

10 a first molding step of molding the first resin into which the second resin is mixed by the mixing step, into a sheet; and

a second molding step of molding a prism-shaped first resin by using a 2P molding method in contact and integral with one of surfaces of the sheet molded by the first molding step.

15 15. The method for manufacturing a diffuser as described in claim 14, characterized by further comprising:

a third molding step of molding a prism-shaped first resin by using a 2P molding method in contact and integral with other one of surfaces of the sheet molded by the first molding step.

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16. A liquid crystal display apparatus characterized by comprising:

a liquid crystal display device; and

25 a backlight for illuminating the liquid crystal display device, wherein said backlight includes a light source for emitting light, and a diffuser disposed between the light source and the liquid crystal display device, and

wherein said diffuser includes a diffusion layer for diffusing the light emitted from the light source, and a light distribution layer, disposed more toward the liquid crystal display device than the diffusion layer, for distributing the light diffused by the diffusion layer toward the liquid crystal display device.

17. The liquid crystal display apparatus as described in claim 16, characterized in that:

5 said diffuser further comprises a light focusing layer for focusing
the light emitted from the light source, formed integrally with the
diffusion layer, and disposed more toward the light source than the
diffusion layer.

18. A backlight provided for a liquid crystal display device for
10 illuminating thereof, characterized by comprising:

 a light source for emitting light; and
 a diffuser disposed between the light source and the liquid crystal
display device,

15 wherein said diffuser includes a light focusing layer for focusing
the light emitted from the light source, and a light distribution layer
integrally formed with the diffusion layer and disposed more toward the
liquid crystal display device than the light focusing layer, for distributing
the light focused by the light focusing layer toward the liquid crystal
display device.

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19. The backlight as described in claim 18, characterized in that:

 said light distribution layer has a prismatic surface on a surface
thereof facing toward the liquid crystal display device.

25 20. The backlight as described in claim 18, characterized in that:

 said focusing layer has a prismatic shape on a surface thereof
facing to said light source.

30 21. A liquid crystal display apparatus characterized by comprising:
 a liquid crystal display device; and
 a backlight for illuminating the liquid crystal display device,

wherein said backlight includes a light source for emitting light, and a diffuser disposed between the light source and the liquid crystal display device, and

- wherein said diffuser includes a light focusing layer for focusing
5 the light emitted from the light source, and a light distribution layer integrally formed with the light focusing layer and disposed more toward the liquid crystal display device than the light focusing layer, for distributing the light focused by the light focusing layer toward the liquid crystal display device.

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22. A light guide plate having a light incidence surface, for guiding light emitted from a plurality of light emitting devices arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface for surface emission, characterized in that:

15 a gate through which a molten material is charged to fill a cavity of an injection molding die during injection molding of the light guide plate is disposed at a position of the light incidence surface where none of the plurality of light emitting devices are arranged.

20 23. A light guide plate having a light incidence surface, for guiding light emitted from a plurality of light emitting devices arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface for surface emission, and being wedge-shaped with a thickness thereof gradually decreasing in a direction of guiding the guided light, characterized in that:

a gate through which a molten material is charged to fill a cavity of an injection molding die during injection molding of the light guide plate is arranged at a position of the light incidence surface where none of the plurality of light emitting devices are arranged.

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30 24. The light guide plate as described in claim 23, characterized in

that:

- if a plurality of light emitting devices having an even number are arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface for surface emission, said gate is arranged
5 at a position between two of the light emitting devices located near the center of the longitudinal direction of the light incidence surface, where none of the plurality of light emitting devices are arranged.

25. The light guide plate as described in claim 23, characterized in
10 that:

- if a plurality of light emitting devices having an odd number are arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface for surface emission, said gate is arranged at a position between a light emitting device located at the center of the
15 longitudinal direction of the light incidence surface, and one of light emitting devices adjacent to said light emitting device located at the center, where none of the plurality of light emitting devices are arranged.

26. The light guide plate as described in claim 23, characterized in
20 that:

said plurality of light emitting devices are light emitting diodes (LEDs).

27. A backlight characterized by comprising:
25 a light guide plate for guiding light incident on a light incidence surface for surface emission from a light emergence surface;
a light source having a plurality of light emitting devices arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface of the light guide plate;
30 a reflection sheet disposed on a side of a light reflection surface of the light guide plate;

a sheet member formed from a diffusion sheet and a prism sheet disposed so as to be stacked on a side of the light emergence surface of the light guide plate; and

- 5 a frame for holding the light source, the reflection sheet, and the sheet member on the light guide plate,

wherein the light guide plate has a gate, through which a molten material is charged to fill a cavity of an injection molding die during injection molding of the light guide plate, disposed at a position of the light incidence surface where none of the plurality of light emitting devices are arranged.

28. A backlight characterized by comprising:

15 a light guide plate for guiding light incident on a light incidence surface for surface emission from a light emergence surface, and being wedge-shaped so that a thickness of the light guide plate gradually decreases in a direction of guiding the guided light;

20 a light source having a plurality of light emitting devices arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface of the light guide plate;

25 a reflection sheet disposed on a side of a light reflection surface of the light guide plate;

 a sheet member formed from a diffusion sheet and a prism sheet disposed so as to be stacked on a side of the light emergence surface of the light guide plate; and

30 a frame for holding the light source, the reflection sheet, and the sheet member on the light guide plate,

 wherein the light guide plate has a gate, through which a molten material is charged to fill a cavity of an injection molding die during injection molding of the light guide plate, disposed at a position of the light incidence surface where none of the plurality of light emitting devices are arranged.

29. The backlight as described in claim 28, characterized in that:
if the plurality of light emitting devices of the light source, having
an even number are arranged in a row at predetermined intervals in a
5 longitudinal direction of the light incidence surface for surface emission,
the light guide plate has the gate arranged at a position between two of
the light emitting devices located near the center of the longitudinal
direction of the light incidence surface, where none of the plurality of
light emitting devices are arranged.
- 10 30. The backlight as described in claim 28, characterized in that:
if the plurality of light emitting devices of the light source, having
an odd number are arranged in a row at predetermined intervals in a
longitudinal direction of the light incidence surface for surface emission,
15 the light guide plate has the gate arranged at a position between a light
emitting device located at the center of the longitudinal direction of the
light incidence surface, and one of light emitting devices adjacent to the
light emitting device located at the center, where none of the plurality of
light emitting devices are arranged.
- 20 31. The backlight as described in claim 28, characterized in that:
said plurality of light emitting devices of the light source are light
emitting diodes (LEDs).
- 25 32. A method for manufacturing a light guide plate having a light
incidence surface, for guiding light emitted from a plurality of light
emitting devices arranged in a row at predetermined intervals in a
longitudinal direction of the light incidence surface for surface emission,
characterized in that:
30 the light guide plate is injection-molded by charging a molten
material for filling a cavity of an injection molding die through a gate

disposed at a position of the light incidence surface where none of the plurality of light emitting devices are arranged.

33. A method for manufacturing a light guide plate having a light
5 incidence surface, for guiding light emitted from a plurality of light emitting devices arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface for surface emission, and being wedge-shaped with a thickness thereof gradually decreasing in a direction of guiding the guided light, characterized in that:
- 10 the light guide plate is injection-molded by charging a molten material for filling a cavity of an injection molding die through a gate disposed at a position of the light incidence surface where none of the plurality of light emitting devices are arranged.

- 15 34. The method for manufacturing a light guide plate as described in claim 33, characterized in that:

if a plurality of light emitting devices having an even number are arranged in a row at predetermined intervals in a longitudinal direction of the light incidence surface for surface emission,

- 20 the light guide plate is injection-molded by charging a molten material for filling a cavity of an injection molding die through the gate arranged at a position between two of the light emitting devices located near the center of the longitudinal direction of the light incidence surface, where none of the plurality of light emitting devices are arranged.

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35. The method for manufacturing a light guide plate as described in claim 33, characterized in that:

- if a plurality of light emitting devices having an odd number are arranged in a row at predetermined intervals in a longitudinal direction
30 of the light incidence surface for surface emission,

the light guide plate is injection-molded by charging a molten

material for filling a cavity of an injection molding die through the gate arranged at a position between a light emitting device located at the center of the longitudinal direction of the light incidence surface, and one of light emitting devices adjacent to said light emitting device located at
5 the center, where none of the plurality of light emitting devices are arranged.